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Heavy Fuel Oil Consumption in Canada

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Heavy Fuel Oil Consumption in Canada

Paul McPhie and Anthony Caouette
Manufacturing, Construction and Energy Division

Summary

Canada's thirst for energy continues unabated into the 21st Century. Despite growing concerns about greenhouse gas emissions, as well as climate change and air quality, petroleum products remain key to satisfying that demand.

These petroleum products include heavy fuel oil, a highly polluting low-grade fuel of tar-like consistency. It is composed mostly of carbon, hydrogen, sulphur and other impurities such as ash, metals and water. (For a more complete description, see the text box on page 4.)

In Canada, no significant shift from the combustion of hydrocarbons toward more benign and renewable energy sources such as hydro-electricity has occurred during the past 15 years. Currently, more than one-third (37.6%) of our total energy demand is still met by refined petroleum products, one of which is heavy fuel oil. This ratio has not changed since 1990.

However, some progress has been made in the case of heavy fuel oil. There has been a small decline in its overall use as an energy source.

In 1990, this low-grade carbon and sulphur-intensive petroleum product was used to produce 419.5 petajoules of energy. By 2005, this production had declined to 387.3 petajoules. (One petajoule contains energy equivalent to about 30 million litres of gasoline, enough to power Canada from all sources for a little more than an hour.)

As a result, heavy fuel oil accounted for 4.1% of Canada's total energy needs in 2005, down from 5.5% in 1990.

This article examines the trends in the use of heavy fuel oil in Canada on the basis of industries and provinces between 1990 and 2005 using mostly data from the *Report on Energy Supply-Demand in Canada* (Statistics Canada Catalogue no. 57-003).

By far, the pulp and paper industry has been most instrumental in the reduction of heavy fuel oil use at the national level. Between 1990 and 2005, this industry cut its consumption of heavy fuel oil by more than a half. The decline was particularly strong in the Atlantic Provinces and British Columbia, where pulp and paper is relatively more important, and to a lesser extent in Quebec.

In 2005, the Atlantic provinces were the main consumers of heavy fuel oil, accounting for 44.4% of national demand. Electric utility companies in Atlantic Canada have shown a persistent dependence on heavy fuel oil during the last 15 years, burning it to generate electricity.

The sector most dependent on heavy fuel oil is marine transportation, where it accounts for more than 60% of energy consumed. The rest comes from diesel fuel. This sector is also the only major user that increased its consumption during this 15-year period. More than half of consumption occurred in British Columbia.

Provincial legislators in Canada and those in many other countries, along with some international organizations, have imposed limits on sulphur oxides and other emissions, forcing thermal-electric power generators and other large industrial consumers of heavy fuel oil to take heed. Time will tell what impact legislation will have on the future use of this product.

What is heavy fuel oil?

Heavy fuel oil (HFO) is a black, low-grade fuel of tar-like consistency. It is composed mostly of carbon, hydrogen, sulphur and other impurities such as ash, metals, and water. HFO is obtained from the petroleum distillation process after other lighter petroleum products such as gasoline and kerosene have been distilled off. Heavy fuel oil is a by-product or residue—along with asphalt—of the distillation process.

The Canadian General Standards Board (CGSB) classifies fuel oils into six categories ranging from 0 to 2 for distillate fuel oils such as gasoline and from 4 to 6 for residual fuel oils which include home heating oil and HFO. In general, the higher the category of the fuel oil, the less expensive it is and the lower its quality (longer carbon chains and more sulfur content). The lower cost advantage of HFO may be offset by additional equipment maintenance requirements in burning facilities, by storage costs, and also by the need to pre-heat it for use in some applications.

Product	Value as % of crude oil feedstock[1]
Premium gasoline	124
Regular gasoline	115
Ultra low diesel	133
Regular diesel	126
Home heating oil	123
Butane	83
No. 6 HFO: 1% sulfur	68
No. 6 HFO: 3% sulfur	63

1. Using West Texas Intermediate Cushing Crude as base of 100%.

HFO is used mainly to produce electricity, to fire boilers and blast furnaces in industry, notably the pulp and paper industry, and to power large marine and other vessels. It is also used to heat some large, usually older commercial, institutional and multiple residential buildings.

The burning of HFO releases sulphur dioxide and other pollutants into the air and has been the target of environmental restrictions on emissions. More information on provincial regulations regarding the use of HFO is provided in a text box at the end.

Energy demand on the rise

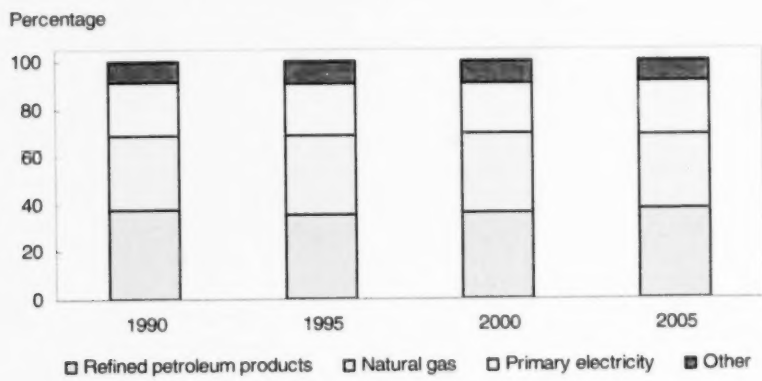
Even though Canadians, like many people in many other industrialized countries, are concerned about increases in greenhouse gas emissions,[1] consumption of energy keeps rising in their country.

Demands from all major energy sources such as petroleum products, natural gas and electricity—produced mainly from the combustion of fossil fuels and from nuclear and hydro sources—have all increased in recent decades.

In 2005, Canada consumed 9,540 petajoules of energy, 25.0% more than in 1990. At the same time, greenhouse gas emissions increased about 25% from 1990 to 2005.[2] (One petajoule contains energy equivalent to about 30 million litres of gasoline, enough to power Canada for a little more than an hour.)

This general increase in demand since 1990 was spread more or less equally across all major sources. During the past 15 years, there has been no significant shift away from the combustion of hydrocarbons toward more benign and renewable energy sources such as hydro-electricity.

Chart 1
No major shifts in Canada's energy sources since 1990



Source: Statistics Canada, CANSIM tables 128-0002 and 128-0009, and Catalogue no. 57-003, table entitled "Solid wood waste and spent pulping liquor, total consumption."

Refined petroleum products, which include heavy fuel oil, accounted for about 3,588 petajoules or 37.6% of total energy demand in 2005, unchanged from 1990.

The other major energy source, natural gas, used notably for home heating, rose proportionally from 31.1% of energy demand in 1990 to 33.4% in 2000. However, by 2005, it accounted for only 31.5%, returning almost to its 1990 level. Natural gas produced roughly 3,007 petajoules of energy in 2005.

1. For more details on these issues, please visit Environment Canada website at www.ec.gc.ca.
2. See Environment Canada, *Canada's 2005 Greenhouse Gas Inventory: A summary of Trends*, 2007, www.ec.gc.ca/pdb/ghg/inventory_report/2005/2005summary_e.cfm (accessed on July 25, 2007).

Primary electricity, generated from hydro, nuclear energy, wind power and tidal power (excluding secondary sources, such as thermal-electric power generation) accounted steadily for about 22% of energy sources from 1990 to 2005. It represented nearly 2,089 petajoules in 2005.

Table 1
Canada's energy demand in petajoules, 1990, 1995, 2000 and 2005

	1990	1995	2000	2005	1990	1995	2000	2005
	petajoules				% of total			
Refined petroleum products	2,886	2,960	3,283	3,588	37.8	35.7	35.8	37.6
Heavy fuel oil[1]	419	302	351	387	5.5	3.7	3.8	4.1
Natural gas	2,371	2,715	3,055	3,007	31.1	32.8	33.4	31.5
Primary electricity (hydro, nuclear, wind and tidal)	1,682	1,824	1,981	2,089	22.0	22.0	21.6	21.9
Other[2]	694	781	839	856	9.1	9.4	9.2	9.0
Total	**7,633**	**8,281**	**9,158**	**9,540**	**100.0**	**100.0**	**100.0**	**100.0**

1. Heavy fuel oil is also counted as part of refined petroleum products.
2. Other includes spent pulping liquor and solid wood waste which are not included in the CANSIM tables.

Source: Statistics Canada, CANSIM tables 128-0002 and 128-0009, and Catalogue no. 57-003, table entitled "Solid wood waste and spent pulping liquor, total consumption."

Decline in use of heavy fuel oil

The consumption of heavy fuel oil as an energy source declined 7.7% between 1990 and 2005, from 419.5 petajoules to 387.2 petajoules. In 2005, it provided 4.1% of Canada's total energy needs, down from 5.5% in 1990.

More than 85% of this decline is attributable to users that substituted other energy sources. The rest (less than 15%) is attributable to the reduced use of energy overall by users of heavy fuel oil.

While not one of the main energy sources nationally, heavy fuel oil is still an important fuel source for some industries. This low-grade carbon and sulphur-intensive petroleum product is burned in quantity for thermal-electric power generation, for heating boilers and furnaces in some manufacturing industries, notably the pulp and paper industry and petroleum refining industry. It is also used to power large commercial marine vessels and to heat some large, usually older commercial, institutional and multiple residential buildings.

Heavy fuel oil is second only to coal as a carbon-intensive fuel. When it is burned, it releases sulphur dioxide and other pollutants into the atmosphere, contributing to greenhouse gas emissions.[3]

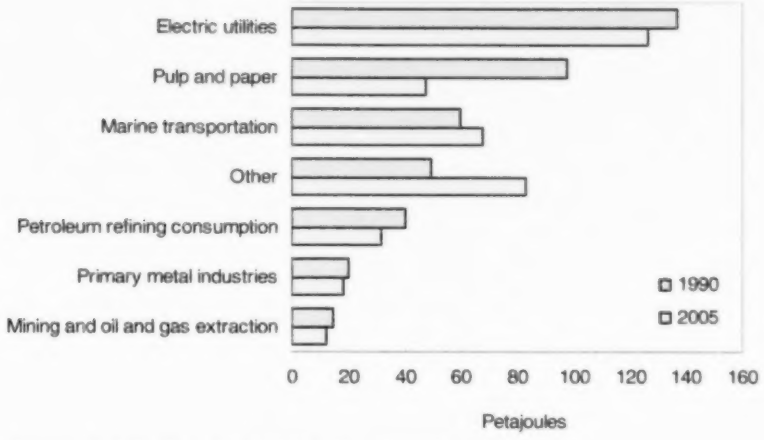
Sulphur dioxide produced by its combustion escapes into the atmosphere in the form of fine particulate matters. This poses a threat to human health because it can travel deep into the lung. This particulate matter is also transported over long distances and can eventually be deposited into water systems, which causes their acidification.[4]

3. See Environment Canada, Statistics Canada and Health Canada, *Canadian Environmental Sustainability Indicators, 2006*, www.statcan.ca/bsolc/english/bsolc?catno=16-251-X (accessed on June 20, 2007).
4. Ibid.

As a result, the use of heavy fuel oil raises concerns about climate change as well as air and water quality, both domestically and internationally. Regulations regarding maximum sulphur content contained in heavy fuel oil are in place in many provinces.[5]

The decline in its use was not distributed evenly among its main users. Many industries have reduced their dependence on this energy source, while other sectors still depend heavily on it.

Chart 2
Major users of heavy fuel oil: Pulp and paper down, utilities and marine still strong



Source: Statistics Canada, CANSIM tables 128-0002 and 128-0009.

Table 2
Heavy fuel oil demand by sector in petajoules, Canada, 1990, 1995, 2000 and 2005

	1990	1995	2000	2005	1990	1995	2000	2005
	petajoules				% of total			
Pulp and paper	97.6	58.7	56.7	47.8	23.3	19.4	16.1	12.3
Petroleum refining consumption	40.0	38.5	39.9	31.6	9.5	12.7	11.4	8.1
Primary metal industries	20.0	15.2	14.8	18.5	4.8	5.0	4.2	4.8
Mining and oil and gas extraction	14.9	16.5	15.0	12.5	3.6	5.5	4.3	3.2
Transformed to electricity by utilities	137.1	80.6	110.1	126.5	32.7	26.7	31.3	32.7
Marine transportation	60.1	56.6	67.8	67.5	14.3	18.7	19.3	17.4
Other	49.7	36.4	46.9	83.0	11.8	12.0	13.4	21.4
Total	**419.5**	**302.4**	**351.2**	**387.3**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Statistics Canada, CANSIM tables 128-0002 and 128-0009.

5. See text box entitled "Heavy fuel oil regulations in Canada" at the end of this document.

Pulp and paper industry instrumental in reducing use

By far, the pulp and paper industry has been most instrumental in reducing the use of heavy fuel oil. Between 1990 and 2005, the industry cut its consumption by more than half, from 97.6 petajoules to 47.8 petajoules.

The decline was strongest in British Columbia (-89.8%) and Atlantic Provinces (-58.4%), where the industry is relatively more important. In Quebec, the decline was a notable 28.7%.

Spent pulping liquor, which contains the fiber removed from wood either chemically or mechanically, has been an increasing source of energy for this industry. It accounted for 34.3% of this industry's energy needs in 2005.

The burning of wood waste, while second to the spent pulping liquor as an energy source, doubled its share from 12.6% in 1990 to 25.4% in 2005.

These two fuel sources combined provided almost 60% of total energy needs for the pulp and paper industry by 2005, displacing traditional energy sources such as fossil fuels. Electricity still accounts for 24.7%.

Table 3
Pulp and paper industry's energy demand in petajoules, Canada, 1990, 1995, 2000 and 2005

	1990	1995	2000	2005	1990	1995	2000	2005
	petajoules				% of total			
Spent pulping liquor	279.1	325.7	342.2	307.9	35.6	37.4	35.6	34.3
Solid wood waste	99.1	134.3	189.2	227.9	12.6	15.4	19.7	25.4
Electricity demand	175.8	201.2	221.7	221.2	22.4	23.1	23.1	24.7
Natural gas	114.9	136.0	125.8	69.6	14.6	15.6	13.1	7.8
Heavy fuel oil	97.6	58.7	56.7	47.8	12.4	6.7	5.9	5.3
Other	18.2	15.5	25.5	22.3	2.3	1.8	2.7	2.5
Total	**784.7**	**871.3**	**961.1**	**896.7**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Statistics Canada, CANSIM tables 128-0002 and 128-0009, and Catalogue no. 57-003, table entitled "Solid wood waste and spent pulping liquor, total consumption."

Utility companies persistently dependent on heavy fuel oil

Unlike other major industries, utility companies in Atlantic Canada have shown a persistent dependence upon heavy fuel oil during the last 15 years.

Utilities in Atlantic Canada currently dominate when it comes to using heavy fuel oil for thermal-electric generation. Almost 15% of the Atlantic region's electricity originated from this fuel source in 2005, down slightly from 1990. Outside Atlantic Canada, only utilities in Quebec and Ontario burn heavy fuel oil to generate electricity, but it is responsible for less than 1% of production in each province.

In 2005, utility companies in Canada used 126.5 petajoules of heavy fuel oil, accounting for one-third of total demand for this energy source. This was a reduction of 10.6 petajoules, or 7.7%, from

the level in 1990. However, the contribution of this sector to the overall decline in heavy fuel oil from 1990 to 2005 was much less significant than the contribution of the pulp and paper industry.

Total production of electricity from all sources by utility companies in Canada has increased considerably since 1990, rising from 1,536 petajoules to 2,005 petajoules in 2005.

Electricity is mostly generated using a combination of nuclear and hydro energy as well as energy from the wind and tides. These sources comprise about 75% of total electricity production.

The remainder is generated from fuel sources burned in thermal-electric power plants. The majority (71%) of these plants used coal, while 19% used natural gas, 8% used heavy fuel oil and petroleum coke, and 2% used a combination of light fuel oil and diesel. According to Environment Canada, thermal-electric power generation, road vehicles and oil and gas production have been the principal sources of the increase in greenhouse gas emissions since 1990.[6]

Natural gas is an increasingly important energy source for utilities where it is available, notably in Ontario, Saskatchewan and Alberta. The dependence of utility companies on coal has dropped in both absolute and percentage terms during the past five years.

Table 4
Percentage of electricity generation by utility companies, by province and energy source, 2005

	Hydro[1]	Nuclear	Coal	NG[2]	HFO[3]	Other[4]
	%					
Newfoundland and Labrador	96.6	0.0	0.0	0.0	3.4	0.0
Nova Scotia and Prince Edward Island	10.0	0.0	71.7	1.9	15.8	0.6
New Brunswick	18.8	21.6	18.0	5.2	36.1	0.2
Quebec	96.4	2.8	0.0	0.2	0.7	0.0
Ontario	22.3	50.2	19.7	7.3	0.6	0.0
Manitoba	98.8	0.0	1.2	0.0	0.0	0.0
Saskatchewan	24.0	0.0	55.8	20.1	0.0	0.1
Alberta	5.4	0.0	81.7	12.8	0.0	0.1
British Columbia	94.3	0.0	0.0	5.7	0.0	0.1
Yukon, Northwest Territories and Nunavut	70.6	0.0	0.0	0.0	0.0	29.4
Canada	**59.0**	**15.6**	**18.2**	**4.9**	**2.3**	**0.1**

1. Hydro includes small amounts of wind and tide.
2. Natural gas.
3. Heavy fuel oil includes petroleum coke.
4. Other includes manufactured gases, other petroleum products, other fuels and station service.

Source: Statistics Canada, Catalogue no. 57-003-XIB, tables 18 and 19.

6. See Environment Canada, *National Inventory Report, 1990-2004 - Greenhouse Gas Sources and Sinks in Canada*, Ottawa, 2006, www.ec.gc.ca/pdb/ghg/inventory_report/2004_report/toc_e.cfm (accessed on June 20, 2007)

Demand for heavy fuel oil in marine transportation still strong

The marine transportation sector, where energy alternatives are more limited, relies solely on two sources of fuel for generating power: heavy fuel oil, which represents 60.7% of fuel consumption, and diesel which represents 39.3%.

This was the only sector to increase its consumption of heavy fuel oil during the past 15 years. Consumption rose 12.2% from 60.1 petajoules in 1990 to 67.5 petajoules in 2005. In contrast, diesel fuel consumption remained fairly constant over the last 15 years.

The marine transportation industry consists of foreign and domestic shipping for transporting passengers and goods, as well as commercial fishing vessels. Sales of heavy fuel oil to ships of Canadian and foreign registry are included in total demand for this product.

In 2005, more than one-half (55%) of heavy fuel oil sales for the marine transportation sector were in British Columbia. An additional 23% of sales occurred in Quebec, 12% in Atlantic Canada, and 10% in Ontario.

Up until recently, heavy fuel oil has been used by the marine transportation industry without additional processing requirements, such as desulphurization. This has made this fuel much more economically attractive than distillates as a fuel source for large vessels.

However, there appears to be significant support internationally for adopting more stringent marine fuel sulphur limits. These may lead to the phasing out of the use of untreated heavy fuel oil as a marine fuel. Canada and the United States are considering adopting such regulations by 2010 to 2012. This may have an impact on the volume of heavy fuel oil sales in Canada for marine transportation purposes.

Emissions control legislation in the marine sector

Emission control legislation regulating marine pollution (Marpol Annex VI and EU Directive 2005/33/EC[7]) was first applied in the Baltic Sea in 2006. Called a Sulphur Oxide Emissions Control Area (SECA), a similar designation will enter into effect in the North Sea in November 2007.

Ships burning marine bunkers in areas designated as SECAs must restrict their sulphur-in-fuel levels to 1.5% (6g/kWh) and must also contain nitrogen oxide emissions at levels based upon their rated engine speeds (e.g. 17g/kWh for engines with a rated speed of less than 130 rpm).

Canada and the United States are currently analyzing the effects of marine emissions in their jurisdictions and are assessing the feasibility of a North American SECA plan with a view to submitting a SECA application under Marpol Annex VI by 2008.

If accepted, the designation may take effect in the 2010-2012 timeframe. Marpol legislation is now under review and even lower sulphur and nitrogen oxide limits—and restrictions on particulate matter emissions—are being discussed.

7. Marpol (Marine Pollution) refers to the International Marine Organization's UN initiative to regulate marine pollution from oil, noxious liquid substances carried in bulk, harmful substances carried in packaged form, sewage, garbage, and air pollution (Annex VI). EU Directive 2005/33/EC is a directive of the European Parliament and the Council of the European Union of July 6, 2005.

Heavy fuel oil use on decline in other industrial sectors

Among the other three major industrial users of heavy fuel oil, the petroleum refining industry consumes some of its own produced fuel to satisfy its energy needs.

This industry, along with the primary metal industry and, to a lesser extent, the mining, oil and gas extraction industry reduced its dependence on heavy fuel oil between 1990 and 2005.

These three industries combined accounted for 62.6 petajoules, or 16.2% of total heavy fuel oil use in 2005. It should be noted that heavy fuel oil meets only a small portion of the total energy needs of these industries, less than 3%.

A quarter of Atlantic Canada electricity demand met by using heavy fuel oil

Regionally, the Atlantic provinces were the main consumers of heavy fuel oil in 2005. They accounted for 44.4% of national demand, or about 172.1 petajoules. Quebec was responsible for 27.1% of national demand (105 petajoules); Ontario, 15.0% (58 petajoules); and western Canada, 13.5% (52.2 petajoules).

Atlantic Canada's dependence on heavy fuel oil can be explained to a great extent by the relative importance of its thermal-electric power generation. In fact, nearly 80% of all heavy fuel oil transformed into electricity by Canadian utility companies occurred in the Atlantic provinces in 2005. In these provinces, 14.6% of all electric energy was produced by heavy fuel oil in 2005, down from 16.3% in 1990.

Outside the Atlantic region, utility companies in Quebec and Ontario consumed the remaining 20% of all heavy fuel oil used by utilities, but this source accounted for less than 1% of their total utility input. Provincial utilities outside Atlantic Canada depend mostly on a combination of hydro, nuclear, coal and natural gas.

Table 5
Heavy fuel oil demand by region in petajoules, 1990, 1995, 2000 and 2005

	1990	1995	2000	2005	1990	1995	2000	2005
	petajoules				% of total			
Atlantic provinces	189.5	152.7	178.2	172.1	45.2	50.5	50.8	44.4
Quebec	105.6	70.0	83.9	105.0	25.2	23.1	23.9	27.1
Ontario	70.9	46.9	50.0	58.0	16.9	15.5	14.2	15.0
Other provinces and territories	53.5	32.8	39.0	52.2	12.8	10.9	11.1	13.5
Canada	**419.5**	**302.4**	**351.0**	**387.3**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Statistics Canada, CANSIM tables 128-0002 and 128-0009.

Decline in heavy fuel oil use originated in Atlantic provinces, Ontario

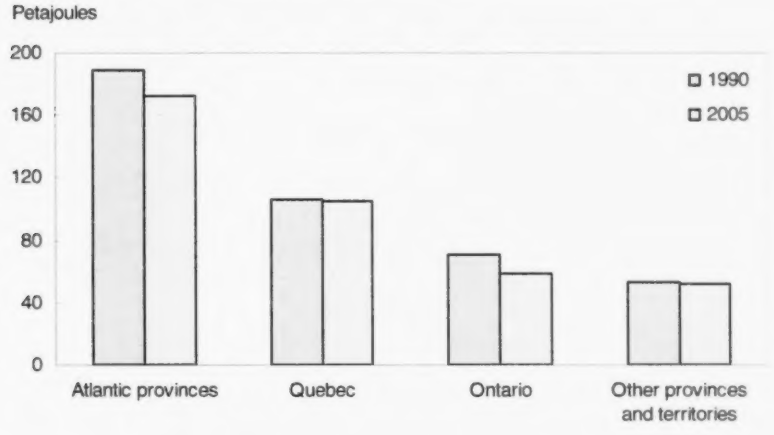
Most of the reduction in the use of heavy fuel oil at the national level during the last 15 years originated in Atlantic provinces and Ontario.

Pulp and paper companies in the Atlantic region cut their consumption of heavy fuel oil by more than one-half (-58.4%), from 25.3 petajoules in 1990 to 10.6 petajoules in 2005. Reductions in Ontario were spread across many industries, including utilities and primary metal.

In Quebec, a significant 28.7% decline in the use of heavy fuel oil by the pulp and paper industry was offset by increases in primary metal and other industries leaving heavy fuel oil consumption unchanged in this province from their 1990 level.

Similarly, the pulp and paper industry in British Columbia has reduced its use of heavy fuel oil from 27.6 in 1990 to 2.8 petajoules in 2005, an 89.8% decline. However, during the same period, heavy fuel oil consumption by the marine transportation industry in British Columbia increased from 16.6 to 37.0 petajoules.

Chart 3
Total use of heavy fuel oil down in Atlantic provinces, Ontario



Source: Statistics Canada, CANSIM tables 128-002 and 128-0009.

Heavy fuel oil regulations in Canada

When fuel oils are combusted, the sulphur in them is emitted into the air as sulphur dioxide and sulphur particulates. These emissions along with emissions of nitrogen oxides are the primary cause of acid rain.

Fine particulate matter, of which sulphate particles are a significant fraction, may also negatively affect the health of Canadians. There are no Canadian federal laws regulating sulphur content in heavy fuel oil (as there are on gasoline and diesel fuel). However, many provinces do have environmental protection, clean air, and waste management acts in place that limit allowable sulphur levels in heavy fuel oil.

These limits range from a low of 1% by mass for certain boiler applications in Ontario to a high of 3% by mass for Type 6 HFO in New Brunswick and 3% in Newfoundland and Labrador where "best achievable technology" is in place to reduce emissions.

Environment Canada monitors sulphur levels in fuel oils. It reports that for heavy fuel oil these average levels have edged down since 2000, from 1.7% in early 2000 to 1.6% in 2005.

The following table provides a summary of provincial legislations relevant to sulphur content.

Table 6
Summary of provincial legislations relevant to sulphur content in heavy fuel oil

Province	Act Regulation / By-Law	Regulation adoption	Maximum sulphur content (% by mass unless otherwise specified)
Newfoundland and Labrador	***Environmental Protection Act*** *Air Pollution Control Regulations*	2004	With Best Achievable Technology: • 3.0%, and • 2.0% on an annual basis. Without Best Achievable Technology: • 2.2%, and • 2.0% on an annual basis.
Nova Scotia	***Environment Act Air Quality*** *Regulations*	2005	• 2.2% by mass; and • 2.0% on an annual basis.
New Brunswick	***Clean Air Act*** *Air Quality Regulation*	1983 (amended 1990 and 1998)	• No. 4 - 1.5 % • No. 5 - 2.0% • No. 6b - 3.0 % • No. 6c - 3.0%
Quebec	***Environment Quality Act*** *Air Quality Regulation*	1981	• Intermediate Oil: 1.0% • Heavy Oil: 2.0%
		Proposed Nov. 2005	• 1.5% as of March 1, 2006 • (no limit if facility has sulphur recovery; 1% equivalent limit for refineries simultaneously using lower sulphur fuel)
	By-Law 90, Montreal Urban Community	1987	• No.6 = 1.25% to 1.4%
Ontario	***Environmental Protection Act*** *Regulation 194, Industry Emissions – Nitrogen Oxides and Sulphur Dioxide*	1970 2005	• Sulphur dioxide for regulated sectors and facilities. • Reductions that can be achieved through lower sulphur HFO have been incorporated: assumes 1% HFO use by iron & steel and pulp & paper sectors by 2010.
	Regulation 361, Sulphur Content of Fuels (Metro Toronto only)	(amended 1980, 1990 and 1999)	• 1.5%
	Regulation 338, Boilers Regulation	1986 (amended 1999)	• 1.0% ; and • sulphur content providing a maximum rate of wet sulphate deposition of 0.1 kilogram per hectare per year (in areas set out in Schedule) Regulation applies to boilers (equipment used for producing hot water or steam) using fuel oil or coal as fuel and excludes: • boilers at OPG electric generating stations, • boilers in dwellings housing max 3 families, • buildings using natural gas or No. 2 oil; and • holders of certificate of approvals where resulting emissions correspond to burning 1% sulphur in fuel.
British Columbia	***Waste Management Act*** *Sulphur Content of Fuel Regulation*	1989	• 1.1%

Source: Environment Canada, Clean Air Online, Sulphur in Liquid Fuels 2004, www.ec.gc.ca/cleanair-airpur/CAOL/OGEB/fuels/reports/SulphurLiquid2004/toc_e.cfm#toc (accessed on June 20, 2007)